**Notebook, N-10-04-10**

This notebook is a continuation of N-10-02-11. It covers the period April-June 1910. All entries are by Edison. The book is the second of three books that contain notes and drawings regarding the development of phonograph recording and reproducing apparatus. Several of the entries note the involvement of Alexander N. Pierman. The first entry indicates that much of this work was conducted at Edison's laboratory at Fort Myers, Florida. Inserted into the book are several pages of notes and drawings relating to the phonograph experiments. The front cover is marked "Phonograph No 2 April, May, 1910." The pages are unnumbered. Approximately 30 pages have been used.

April 10th 1910

2nd book of Florida Experiments on the Phonograph,

The first time I ran over with SR Premier Italy on 1" Ruby Dia Celluloid I could not hear the sign of a scratch. The 4th time over it was plain as Cockerman showing that with SR 1 of that there is a drag of the sale on the wax which causes it to flow in direction of rotation + probably makes little mounds not discernible in the record, can see in Microscope that the surface is slightly roughened.

Evidently when using White wax a very delicate reproducer should be used to test it as Reg will undoubtedly roughen it at start the scratch although it cant be heard —

As the music (not) Piano was good on Mouton there is apparently no reason why should not use considerable harder Needles

Apl 10 1910

I think that the best secondary knife would be a black Diamond. When yd back have one made

It may be that a little castor oil on the knife edges of the Remington Draftin might improve the sensitivity

All the Experts in books I run to now is with old 25 yr old piano, here it has a Curtain hanging over the strings & the felt hammers Comes up & unslad of striking directly on the strings strikes the ~~[illegible]~~ strings thru the Curtain — But the Curtain was raised on all keys lower pitch than middle C, Middle C & 2 keys lower pitch strike Curtain No other key of low pitch

Apl 10 1910

Chlorinated Soluble Lac addition of acetate xi don't condense Lac gets like Can be mixed in very fine powder but a knuckle is as hard as gum phenol paper Formal Compound — press fine —

I think acetates are just the thing for mixing Oxides as the Lac keeps Lac from Condensing Try acetates Zinc, lead, Copper Aluminum, antimony, proto acetate Fe detto Mn,

Apl 10 1910.

1" Reeder

Celluloid nonferous center double

double

1st adjustment. Chatter & rolling. Mellow
made several adjustments 80 thread
screw ½ turn at time. Chatter & co
gradually got less finally after
10 or 12 ½ turns or say 1½ @
2 turns Chatter & rolling disappeared
some chords are abnormally
Loud one chord has a crack
sound but last adjustment
almost disappeared —
There is one chord that is
abnormally apparent in Volume
it has been taken in the 1"
with all changes so it
must be checked in.

On good adjustment for
Pianos — Happily 3 sing
accompanying pianos, with
funnel 2 ft from seg

Apl 10 1910

position away from the Piano &
Women 4 to 5 ft from funnel
Came out loud enough but
there appeared to be interference
in some of the women's notes
it was not good —
They then sang Lady Lu
without funnel 3 ft away
it was not good — There is
Evidently something interfering
something loose possibly
Edge leak — It was
loud enough (16 women
although Could not see rylly
with Naked Eye. In the
SR that makes it loud
yet Piano shows plainly to
Eye but all the sound is
at bottom of groove
probably .0003 variation
We now go back to Piano
gave more pressure still
just as loud & still uneven
Cant not go bad — We
now give it a double dose
of the tightening screw —

Apl 10 1910

This is much better still mellow & not so much crispness, a small crash one chord & one a Gnomal Loud but less than previously Consequently notice any lessening of volume during all these tightenings — Another tightening slightly diminished volume of the more soft but sharper but its not rich or mellow & too unknown to please

Possibly the lever of steel is too heavy & the difference in momentum is trouble we are making a Celluloid lever

If we have a compound body like 2 pivots of which are only in contact the ~~other~~ outer one being the heavy body it would seem that of the two were given a sudden motion the heavy or outer body would tend to separate or at least reduce the

Apl 10 1910

pressure of contact & create another wave. This is probably the cause of the crash

The lever weighs 180 mlg the center celluloid jet out 60 — 1/3 of 180 is 60 & 60 for center makes 120 having full amplitude whereas the dia weighs 80 & has 1/2 amplitude equalling on 40 for momentum —

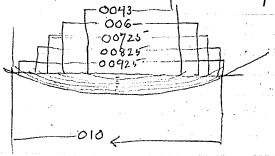
Evidently the lever must be of celluloid & weigh 40 mlg 1/3 of which would have full amplitude or 13. This with center 60 gives 93 - against 40 for diaphm - possibly this will be OK —

P put Rec'd 1/16 in advance of center

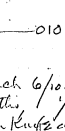
This is much better no crash

2 min Record

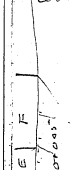
Divided into 6 parts. Apl 10 1910




for each 6/1000 - the track has above width, 1/2 of the total depth. when knurled bottom is



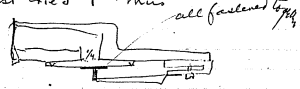
This shows the advantage of tracking deep




Apl 10 1910

One sixth of total depth is got in widening the track only $\frac{1}{1000}$ or 1/10th of the space, 1/3rd of the available depth only uses 2/1000 - 1/2 of the depth only uses .0325 or 1/3rd of the model ~~the~~ space,

Just tried 1" thin




flat celluloid - its awful sensitive

~~Bet~~ Mellow Beet has lots of something in it fingers in bars make it good. its louder 3 ft away from funnel. Hard Rec 10 with Ring dia is close to piano, its mellow when ~~clean~~ & cohesive in it undoubtedly of shaped to (it has the same quantities of volume

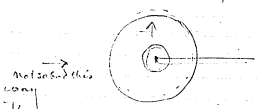
Apl 10 1910

remove clothes it would not be so sensitive but it would be more than 1" Ring Dia, so far Ring Dia preferable

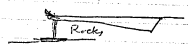
We are now to put in a short 1/4" steel taper in place of the 3/4" —

It will be stiffer but we can then it down at the clamp —

I notice on sketch previous page that the dia slips easily sideways rocks.



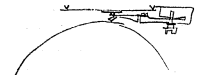

The arm is too far away from the Dia




Apr 10 1910

Think it gets a false movement in it which is recorded

Should be thus

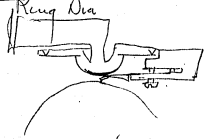


Very short + rigid on it

Dia should be 1/16 longer to leave some Margin —

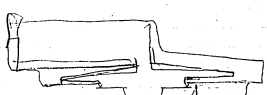
Think I noticed a buckle in Dia when pressed a little in

With Ring Dia



Try double Celluloid 2 dia
" Paper 2 or 3 Kinds —
" Mica 003
" Rubber

I run over the old Piano Record with steps, in made with $1\frac{1}{2}$ or $1\frac{5}{16}$ Ring dia Mean
All Cutter Knife Edges are rubbed They are round & mellow & not uneven like I made Celluloid,
So it the Chamber or the Celluloid

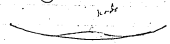


Try 2" Chamber on 1" dia

see if that makes. Uncertain – The wind pressure will rise slower in the large Chamber than the small one –

When a Reader is adjusted mellow & sensitive, the Chords give shaken & rolling where no Edelmann of Jenny Lind T. Even when fundamental growls away & volume diminishes
The only thing I know can attribute it to is that
the work done by the knife I throws a Node in the Cylinder

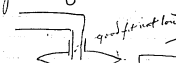
of the dia & it makes 2 Kinds of Vibration



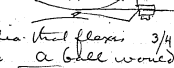

thus node is accentuated by momentum of knife vibration –

April 11. 1910

Forget rid of nodes how is this




No dia that flexes 3/4" dia – 1/8 tube a ball wound 6 oz good

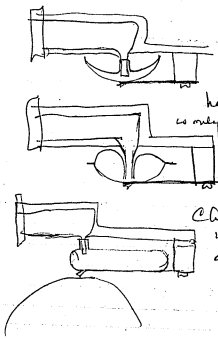


and the weak also

My theory was wrong – Everytime we have tried things like this have failed –

April 11 1910

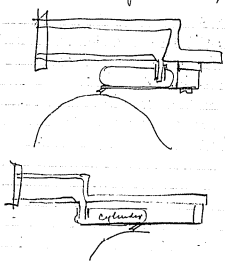
These shellac & cork may be due to the difference between the natural vibration period of the arm & the dashpot. They clash.
If both could be got alike probably trouble would disappear.

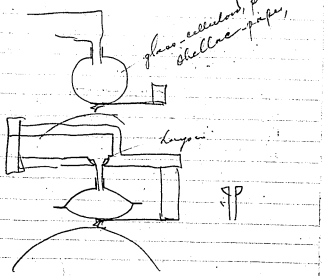


I fear the bug here is that there is only cushioning of the column of air in the 1/8 tube

Hinge of chamber has nothing to do with it

April 11 1910 all NG



Apl 11 1910

It is surprising what a stiff spring to hold Chamber & Reeds must be used to have a vibrating time sufficiently rapid to follow the piccolo or high Soprano, Its because the Chamber acts as a loaded or weight on Extreme end of lever, This slows the natural vibrating time so that a very stiff short spring must be used, have been trying with reed in Vic with a load of Lead equal to wt of Chamber & find of load wt in End of Reed must be 10/1000 thick 3/8 wide — This is too short for practical use probably 3/4 long 3/8 wide & 30 or 40/1000 thick. It will be a great advance if this idea can be made practical, as there is only one flexing point & that quick & controllable, we get rid

April 11 1910

of buckles, nodes, friction, binding of parts, sections in tune with some notes & other Evils — The only new evil in this new device is the sliding sections, & leakage, this I feel sure can be got practical with 1 to 1½/1000 leaking around the 1/8 tube — The other is to balance the chamber on the spring so there is no bending of the bar to get to parallell if out of true, The other is to get quickness & sensitiveness in the Reed —

Another thing occurs to me the weight of the Chamber slows the reed also the depth of tracking does same thing, so this will again indicate a stiffer reed to be quick enough & also to not be in tune with pianos or Sopranos or a time of 6 to 8000 seconds.

Apl 11 1910

Possibly the slowing up of the vibrating time of our Reg recorders by work done on way when chords are struck is cause of Clatter because we know that if we get clatter & why & we stiffen spring it disappears unfortunately the semitones also disappear

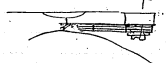
This is best Explanation yet

## Explanation of Clatter & Why

this is why Quality is better on 4 mm than 2 mm

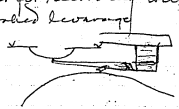
This would call for a record way that had minimum power to cut or friction,

Apl 11 1910



put pieces in between springs so when Chord comes the quicker also maximum —

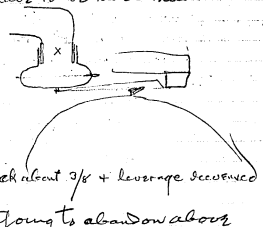
If above explanation is true then a 100/1000 Cutter would be better for recording with demagnetized Dewarage



& maximize the loudness by amplifying Reproducer like SR Even the Reg 40/1000 ball is ok but not so good as 80 or 100 for light tracking

Apl 11 1910

To make the Resonator Idea work it will have to be made this




Sliding weak about 3/8 + leverage screwed 3 to 1

Going to abandon above principle for a while —

Have furnished the Wedge Recorder the analogue of the Standard Reader — it is provided with Indexes + we shall not test out this principle accurately It look favorable to stop Clatter + Whiz as I fear that the heavy Chokes cause a delay of the knife + rebound — but in the wood-lathe

Apl 11 1910

the knife travels like a scoop + not up + down perpendicular the shape will be a little different but the knife will cut it in entirely new + better way —

If for speed up + cut the usual way knife might not keep but friction would increase on account of cutting more wax in the same time therefore the way of cutting is the only way out —

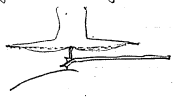
April 12 1910

Tried wedge recorder its weak + has saw whiz in it.

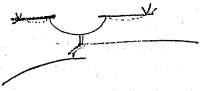
I am at last convinced by Elimination that the trouble (to) clatter whiz etc is due to the action of the work done by the knife on the diaphr producing a

Apl 12 1910

double movement instead of a pure single movement which it would do if no power was absorbed by Cutting the form of the waves, + that this Extra motion is thru in a plain diagram



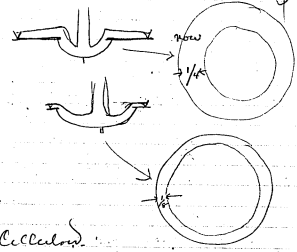
It is made less by new Recorder



The extra of double motion is not very strong as it is eliminated by putting fingers in ears or pressing 98% of the Volume sounds.

April 12 1910

I believe I know can increase the sensitiveness of Recorder to make the overtones come out clear + give mellowness to Piano + at same time suppress the extra waves which comes audable on the heavy Chords expects the co-hade thing




Using Celluloid.

"The narrow ring will bulge within itself in addition to forming with Cavity the Reg large waves but it will require a small proportion of the pressure + is so stiff that it will be inaudible

Apl 12 1910

Possibly the ring now used 1" Dia 1/4" width of ~~Cor~~ One Corrugation put on its middle it might reduce the sub flexion

Another thing that is we do wrong in connecting the non flexing Center rigidly to the Knife Rod, This produces unequal pressure on Ring Dia - must have Ball & Socket or Knife Edge.

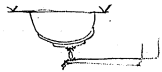
The chamber must be kept small & 1/8 hole to funnel used.

Non flex Center piece must be light - we have just

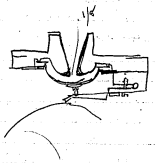
Apl 12 1910

Made one of Celluloid reinforced iron

probably ought to be



The smaller the width of the ring dia & greater its flexing power is the nearer we will get to surpassing the extra wave,




Bass Figure

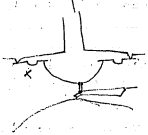
both Ring can be centered

April 16 1910

Tried

Celluloid .005 —

This is entirely too low —




X corrugated & of .0035 aluminum
Entirely too weak, sharp & not mellow —

The best is Celluloid & paper

Paper is more mellow &
I think Cotton used the dried
spongy paper used on wrapping
Kodak films — 1/16 1/16

I shall now try all kinds

April 16 1910

paper, cork, Tissue shell, Tapioca & cake
but think paper will be the best
don't think it will act under
pressure like Celluloid —

Mica & Mary tried & all
recorded perfect. Left away
from Funnel & sound enough

The Corrugation evidently stopped
the Crackle & stopped the
Clatter, Lohz & saw file
sounds, & the Dia now gives
no subvibration due to agitation

Had I kept to Metals, glass &
Mica never would have
discovered this ~~the best~~
Could not Corrugate glass
very well & Mica not at all
& Metals would have been
a ridiculous failure
Yet seeing how celluloid gave
best results in the Dev
Reader I kept experimenting
with it on Recorder, & it

Apl 16 1910

only succeeded when I put that Corrugation in

Using only 1" dia of Cone helped as it gives a very light vibrating platform & reduces chances of Gurgling

I think that if we shorten & lighten Knife lever we will still further improve it.

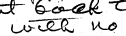
Putting in the Toggle between non flapping Center & Knife lever was another improvement as it prevented the Center Evenly around the Edges of the Ring Dia —

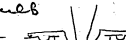
All a happy Combo

I think we are now fixed to make the Grand Cumberal 4½ X 7½ Cylinder & Record a Record Hasenpfeffer of Beethoven Hymn

Possibly a Magnesium arch Center & thin glass would be better than Aluminum as they could be made lighter

I forgot to mention that when we used 1/8 hole leading to funnel & bulb Extension there were a number of Saw filing sounds came in which disappeared when we went back to the Reg hole 1/4" with no Extension or bulb

A  ng -

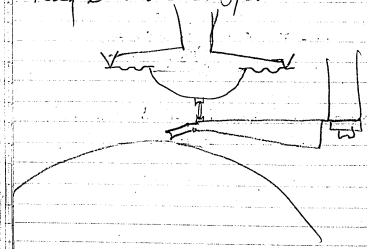
B 

Louder than A - bored X out to 3/8 & this was still louder & clearer —

Apl 16 1910

Think 1/2" with 1" Dia is the right thing - Egglestone making Wkg drawings for one Carrying the 1/2 Clear thru to funnel —

The Double Corrugation ring Dia is Good yet



May 4 1910 —

Now got fixed again to funnel

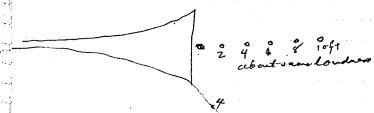
Tried Viscose one corrugation dia good but it soon self deflects =

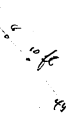
Acetocellulose 1 in 9 film 4 1/2/1000 holds it is good — one corrugation in ring = am making some of different thicknesses =

Big funnel 12 ft 5" Mouth Good for hard —

Tried distance from funnel

OVE



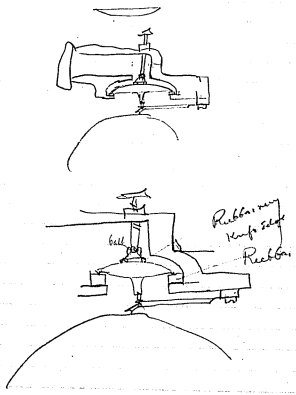

4 ft on 45 $\frac{1}{3}$ the loudness
of 2 ft front — 10 ft is less
than at 45°

Showing LOEak mets
must be in front
fee mmulq & hound ono
on the angle —

Want to get it more
sensitive yet =

Don't think the Geq
formul. is any good
for tracking —

June 25 1910



5%

10
15
20

52 grams

104
156
208

20°
40°
60°
80°

8.00
85
4000
6400
6.800

2,80

446
289
3568
8920
1.288

100
85
500
800

1250 grams

30

210.

8.5
120
170
85
102

32.

225
32
450
675
7200

225
32
675

225
32
450
675
697

446 | 1025 (2.3
892
1338
1338

1025
5
5125

Area in ⅒ of diaphrm

| | | | | | |
|---|---|---|---|---|---|
| 15/16 | 441 | 21 | | | 10.5 |
| 1 " | 256 | 16 | 58% | of above | 8 |
| 7/8 | 196 | 14 | 45% | " " | 7 |
| 3/4 | 144 | 12 | 33% | " " | 6 |
| 5/8 | 100 | 10 | 23% | " " | 5 |
| 1/2 | 64 | 8 | 15% | " " | 4 |

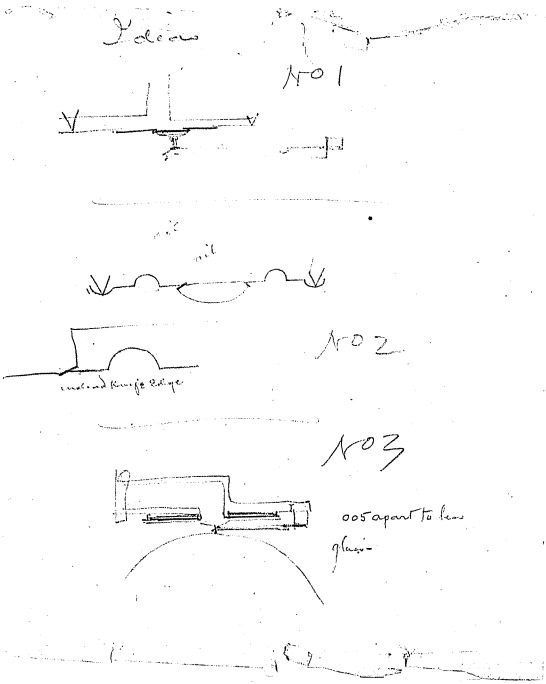
Ease of flexure of outer Edge fastened is square of length.

| | | | | |
|---|---|---|---|---|
| 15/16 | max sensitive sqr length | | 63 | 1 part in 16 |
| 1 | 1.95 times less sensitive | " | 48 | 1.31 less |
| 7/8 | 2.55 " | " | 42 | 1.50 less |
| 3/4 | 3.47 " | " | 36 | 1.75 less |
| 5/8 | 5.00 " | " | 30 | 2.1 less |

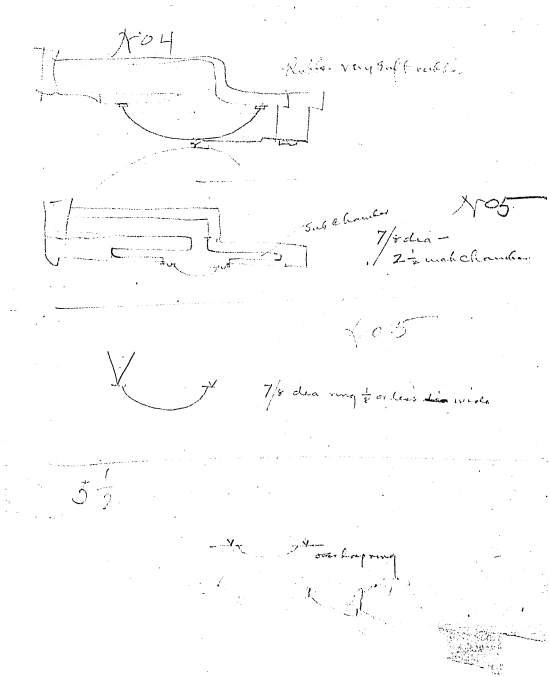
1" on a lever is 1.95 less sensitive but
1.31 more " around Edges
.64 leaving it .64 less sensitive

Weight w/ Cut on Cutter in metal probably 3/4 of weight
a

[ITEM FOUND IN BOOK]



[ITEM FOUR IN BOOK]



[ITEM FOUND IN BOOK]

No 6

To keep falling out.

3 inches gauge at

No arm –

No 7 = Soft screw blank always make muffled & cut
blind screw. make some of fuse & other soft wax
lighting weights & have large & small brackets make
[illegible] Mould
[illegible] Hard
[illegible] read.
always [illegible]